

# DPC-520 PRESSURE VOLUME CONTROL

- Two precision pressure sensors built in
- Ultra low pressure or volume control
- High accuracy measurement repeatability
- Long term sensor stability and auto zero
- Password protected keyboard and display
- Analog and digital interface with BMS
- High and low Alarm thresholds and timers
- Volt free contacts for remote alarms
- Door switch control freeze with timer
- Two Modbus rtu communication networks
- After Sales Service is provided by CMR
- 24 month warranty
- 30 Years field application experience

## GENERAL

The DPC520 provides accurate air volume and room pressure control in process control applications such as clean rooms, laboratories, high containment facilities and many commercial applications.

The secret of the high accuracy measurements are the two built in CMR pressure and volume transducers which have proven themselves also in harsh environments. The pressure ranges from +/-10.0Pa to 7500Pa are factory calibrated and have traceable calibration certificates to international standards. The display can indicate the measured values in either Pa, hPa, kPa, m/s, l/s, m3/s, m3/h or ACR (air change rate).

The principle of the control is simple. The CMR Transducers provide a stable and repeatable pressure measurement with a linearity of 0.25% and the control loop is extremely fast to control fan speeds, air valves and dampers with powerful and fast response drives and actuators. The drives can be electric or pneumatic.

## CMR TRANSDUCER

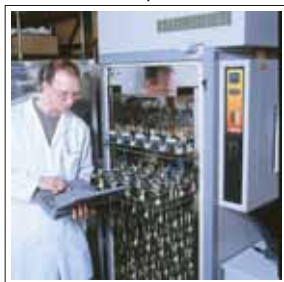
The transducer is manufactured by CMR with high precision engineered components. The principle is the measurement of the displacement of the diaphragm by means of a push and pull variable reluctance circuit which is not affected by humidity and hence it can be used in any industrial or commercial environment. There are no mechanical connections to any of the sensing coils and the diaphragm.



CMR Transducer

Extremely low pressures can be measured with excellent repeatability and minimal hysteresis. The diaphragm displacement is so small that no air volume is required to measure the air pressure which means measurement tubing can be connected in excess of 200m without losing accuracy of the measurement speed.

The zero drift is minimized by the measuring copper coils which are matched to provide excellent self compensation. One coil measures positive and the other negative drift and therefore balances any excessive drift between two tolerance limits in its life cycle. The CMR Transducer has a proven field track record of over 30 years. All CMR Sensors are temperature compensated in a computerised climate chamber.



CMR Climate Chamber



DPC-520 Pressure-Volume Controller with two built in Sensors

## CONTROL OUTPUT

The DPC520 can drive all fast and slow moving actuators such as synchronous motors with drive open-stop-close action or industry standard actuators with control inputs and feedbacks of 0..10V and 4..20mA. Because of the high speed and resolution of the sensor and control loop, the controller is capable of driving the actuators to the required position precisely and without hunting.

## AUTO CONTROL SET POINT AND FEED BACK

A main set point and a secondary set point i.e. night set back can be adjusted via the keyboard. External set points can be transmitted by analog 0..10V and 4..20mA or digitally via Modbus communication from a central BMS. The actual control value is continuously monitored. This value is available as 0..10V signal to the BMS, remote LCD display and on the modbus network.

## HAND-AUTO CONTROL

A Hand-Auto keyboard control button is provided. When selecting the Hand option, the actuators actual position is written into memory and hence the actuator shall not run away. By pressing the up or down key, the set point of the hand output to the actuator or speed controller can be adjusted to any position. This is ideal for commissioning or emergency actions. The actual position of the actuators or fan speeds are continuously monitored and is expressed as 0..10V to the BMS or remote display. It is also on the modbus network.

## ACTUATORS AND DAMPERS

The DPC520 can control almost any range of dampers or fan speed controls with a variety of actuation times from 1s up 400s without hunting. It is recommended to use CMR approved actuators and dampers as the mechanical strength of the actuator drive shaft is critical when operating at very high speeds. The DPC is compatible with all industrial and commercial actuators. The internal power supply of the DPC can drive actuators up to 48VA at 24Vac. Larger drives need an external power supply.

## POWER SUPPLY

The DPC520 has a built in isolation transformer complete with a main fuse therefore eliminating additional power supplies on site. It can be supplied in 24Vac, 110Vac and 230Vac and has a flying lead for easy connection on site.

## ENCLOSURES

The DPC520 enclosures are wall mount and supplied with a perspex front lid. A keylock is available. When the lid is fitted, the enclosure has a protection class of IP65. The front control panel is a custom made keyboard and LCD display. The cable glands are fitted and sealed. Two sets of the transducer tube connections are fitted and consists of chromed brass nipples identified as red for positive and blue for negative pressure connections.

**CMR CONTROLS** Ltd  
Precision Air Pressure and Volume Sensors

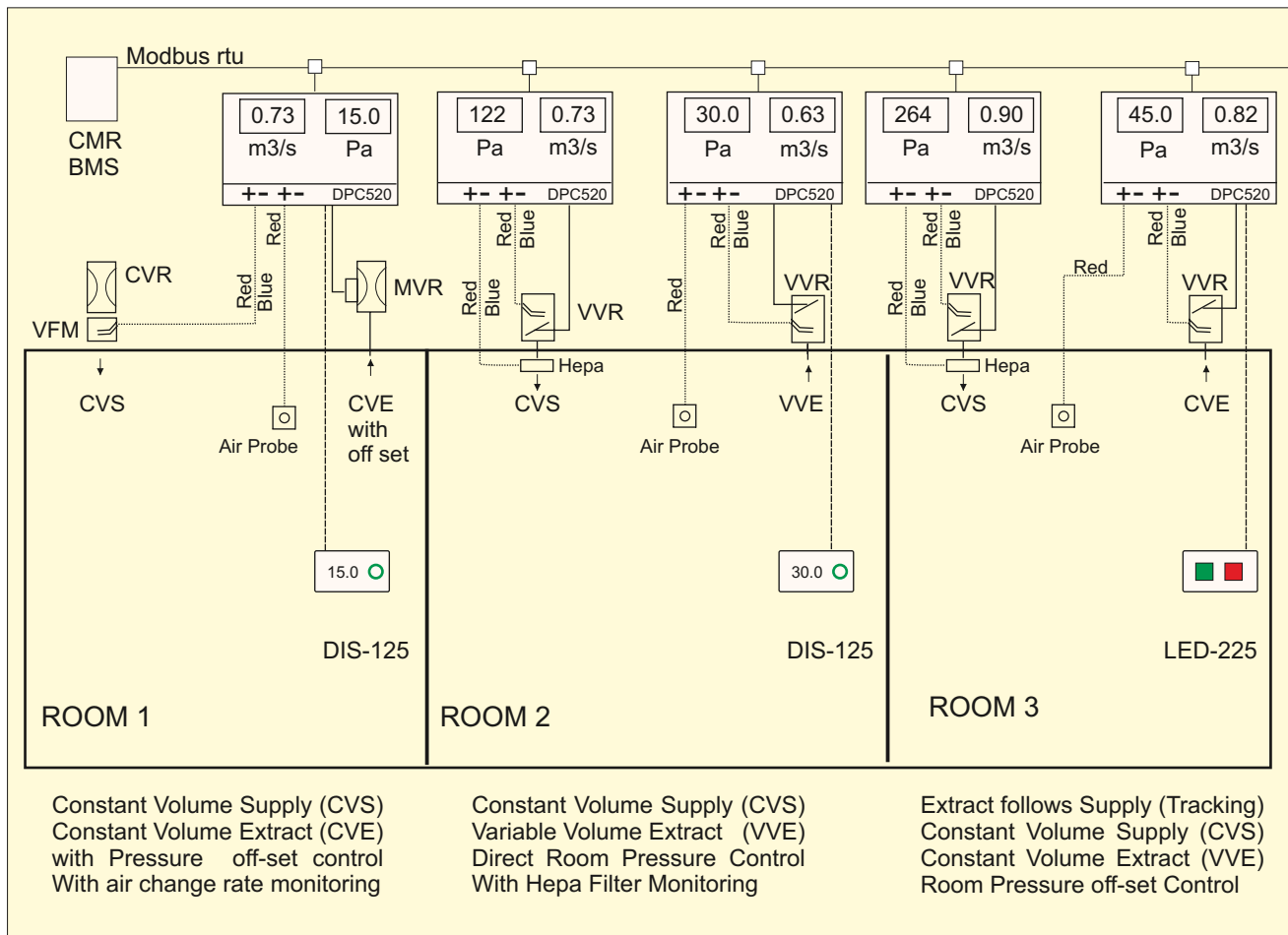
22 Repton Court Repton Close  
Basildon Essex SS13 1LN GB  
web www.cmr-controls.com

Phone +44 (0) 1268 287222  
Fax +44 (0) 1268 287099  
mail sales@cmr-controls.com



# DPC-520 PRESSURE VOLUME CONTROL

Three Typical Constant Supply Air Volume and Room Pressure Extract Control methods



## ROOM 1 Supply and Extract

Room 1 has a mechanical constant volume supply valve CVR which provides an accurate volume regardless of the static pressure changes in the duct. It is factory calibrated. The VVM round flowgrid is connected to the supply DPC and monitors the air change rate for validation purposes. The extract has a motorised constant volume valve MVR, which is similar to the CVR but the volume can be changed from remote. The room pressure is measured by the extract DPC and it controls the MVR by changing the set point to achieve 15 Pa. The CVR and MVR cannot be shut off. A remote display of the room pressure and alarm is connected to the extract DPC.

## ROOM 2 Supply

Room 2 has a VVR valve on the supply duct. The DPC measures the air volume in the VVR and controls a constant air change rate into the room. A second pressure sensor built into the DPC monitors the HEPA filter for longer life.

## ROOM 2 Extract

Room 2 has a VVR valve on the extract duct. The DPC measures the air volume in the VVR and monitors the extract air change rate for validation purposes. A second pressure sensor measures the room pressure against a reference and controls the actuator on the extract VVR directly to maintain a room pressure of 30 Pa. A remote Display and Alarm is connected to the extract DPC.

## ROOM 3 Supply and Extract

The supply and extract VVRs are controlled having both constant volume control. The extract follows the supply in volume which is done via the modbus network and is called 'Volume Tracking'. The room pressure is measured on the extract DPC and an off-set control loop controls the room pressure to 45 Pa by changing the set point of the constant extract volume VVR valve. The supply DPC has a second sensor which monitors the supply HEPA filter for validation purposes. A remote LED alarm plate is fitted indicating with red or green lights the alarm status.



DPC-520 Controller



Ceiling Air Probe



Tubes + Fittings



DIS-125 LED-225



VVR Valve



CVR Valve

**CMR CONTROLS** Ltd  
Precision Air Pressure and Volume Sensors

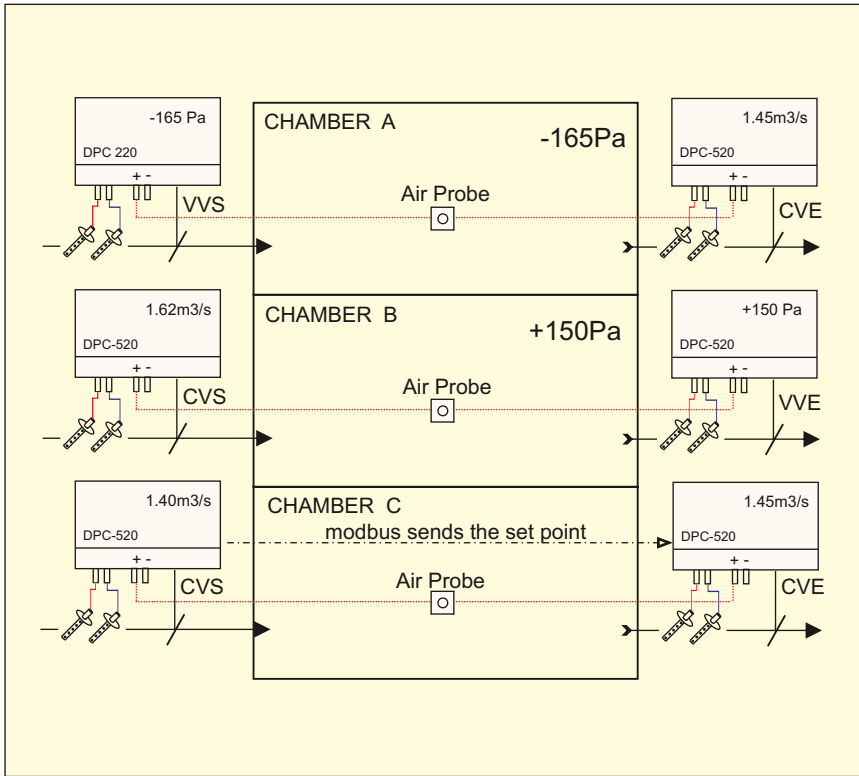
22 Repton Court Repton Close  
Basildon Essex SS13 1LN GB  
web www.cmr-controls.com

Phone +44 (0) 1268 287222  
Fax +44 (0) 1268 287099  
mail sales@cmr-controls.com



# DPC-520 AIR CONTROL APPLICATIONS

TYPICAL TEST CHAMBER CONTROL - POSITIVE - NEGATIVE AND VOLUME TRACKING WITH THE SAME DPC-520



## DPC520 CONFIGURATION

### CHAMBER A

The extract is configured as constant volume extract (CVE) to maintain 1.45m<sup>3</sup>/s.

The supply air is set up to be variable volume supply (VVS). The chamber pressure is measured via the air probe and the supply damper is controlled to maintain -165Pa in the chamber.

### CHAMBER B

The supply air is configured to be a constant volume supply (CVS) to maintain 1.62m<sup>3</sup>/s. The extract is set up as variable volume extract (VVE). The chamber pressure is measured via the air probe and the extract damper is controlled to maintain +150Pa in the chamber.

### CHAMBER C

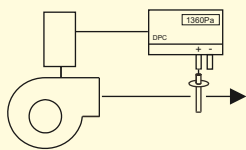
The supply is configured as constant volume supply (CVS) master and the extract is configured as constant volume extract (CVE) slave with more extract. The chamber pressure is measured via the air probe and the extract damper volume can be off-set to have the room slightly negative. (Tracking with off-set)

The above schematic shows typical applications for the DPC controllers. The DPC is used for process and heavy duty industrial installations and they can be mounted on the valves in the field or in a central control panel, which makes calibration, maintenance and validation easier in future. Commissioning is very easy via the modbus network from remote. The CMR PVC tubing can be run up to 200m in length to any of the above constant volume venturi valves and the chamber pressure air duct probes. The DPC is a standard controller which can be configured to provide constant supply, constant extract, variable volume supply or variable volume extract. It has the necessary interfaces to be set up as a tracking controller which means either supply or extract can be tracked with an adjustable off-set. All functions are easily selectable.

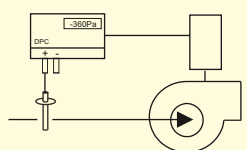
The CMR dampers and valves are fitted with CMR fast and heavy duty actuators and the mechanical connections and the gearboxes have been designed for continuous high torque and speed action. All DPCs can be connected to BMS, SCADA or PLC computer systems to read in the pressures, volumes and feedbacks and write set points, night set backs etc. In case of BMS computer failure, the DPC reverts back to its default set points, a vital advantage in critical manufacturing processes. All DPCs have control freeze and timed release when chamber doors are opened and closed. The DPC is supplied with traceable calibration certificates to International Standards and site certification can be carried out by CMR. In fact CMR provides a complete commissioning and site calibration service.

## TYPICAL STATIC PRESSURE AND CONSTANT FAN SPEED AND VOLUME DAMPER CONTROL APPLICATIONS

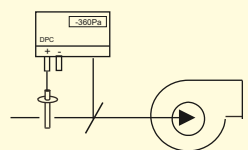
### STATIC PRESSURE CONTROL



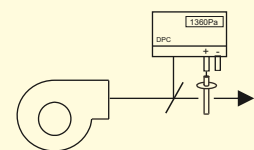
Supply Fan Speed Control



Extract Fan Speed Control

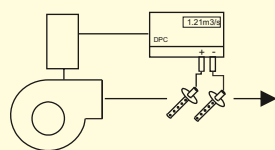


Extract Damper Control

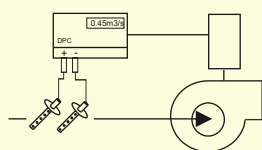


Supply Damper Control

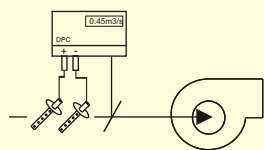
### CONSTANT VOLUME CONTROL



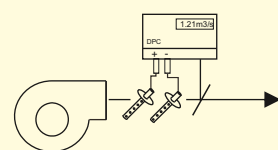
Supply Volume Fan Control



Extract Volume Fan Control



Extract Volume Damper Control

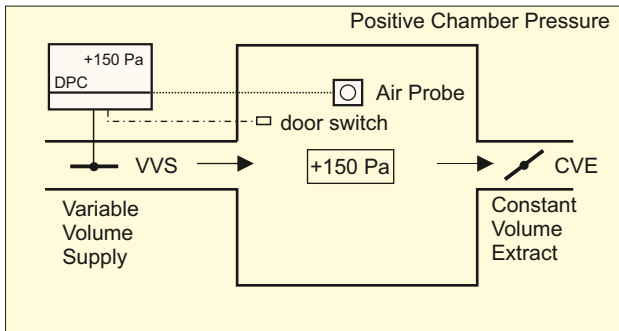


Supply Volume Damper Control

# DPC-520 DAMPER CONTROL METHODS

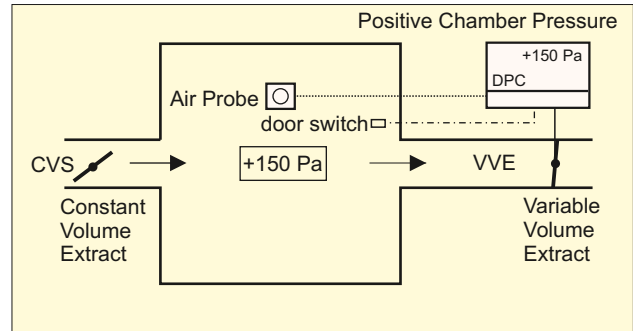
## INDUSTRIAL TEST CHAMBER AIR PRESSURE - AIR VOLUME DAMPER CONTROLS WITH A DPC-520

Mode 'A'



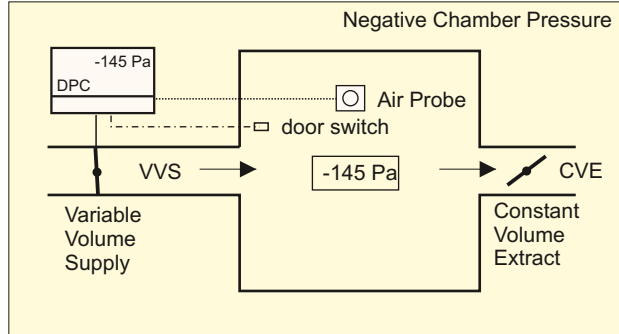
The chamber must be controlled at +150Pa positive pressure using variable volume supply and constant extract. On start up, the supply damper must be open and starts closing if the pressure is greater than 150Pa. The damper motor stops when a door is opened and re-starts after a time out when closed again.

Mode 'B'



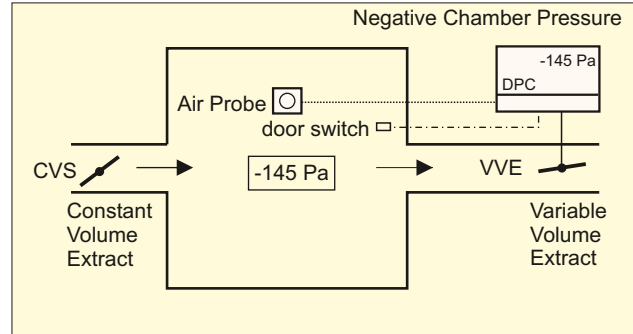
The chamber must be controlled at +150Pa positive pressure using variable volume extract and constant supply. On start up, the extract damper must be closed and starts opening up if the pressure is greater than +150Pa. The damper motor stops when a door is opened and re-starts after a time out when closed again.

Mode 'C'



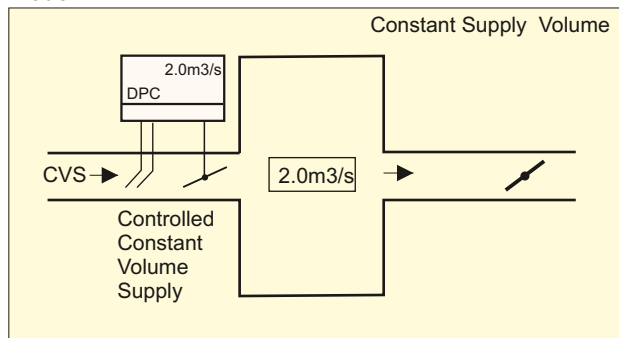
The chamber must be controlled at -145Pa negative pressure using variable volume supply and constant extract. On start up, the supply damper must be closed and starts opening if the pressure is more negative than -145Pa. The damper motor stops when a door is opened and re-starts after a time out when closed again.

Mode 'D'



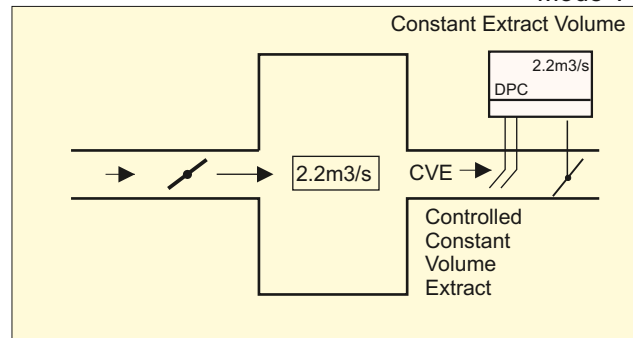
The chamber must be controlled at -145Pa negative pressure using variable volume extract and constant supply. On start up, the extract damper must be open and starts closing if the pressure is more negative than -145Pa. The damper motor stops when a door is opened and re-starts after a time out when closed again.

Mode 'E'



The chamber must be controlled at 2.0m³/s constant supply volume. On start up, the supply damper must be open and if the volume is more than the set point the damper starts closing to achieve the required constant volume. The controller has an adjustable set point to vary the supply at any time. The DPC can be linked to an extract DPC controller if fitted to provide supply to extract tracking.

Mode 'F'

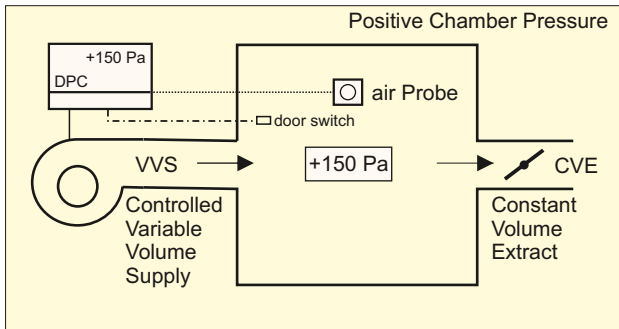


The chamber must be controlled at 2.2m³/s constant extract volume. On start up, the extract damper must be open and if the volume is more than the set point the damper starts closing to achieve the required constant volume. The controller has an adjustable set point to vary the extract at any time. The DPC can be linked to a supply DPC controller if fitted to provide extract to supply tracking.

# DPC-520 FAN SPEED CONTROL METHODS

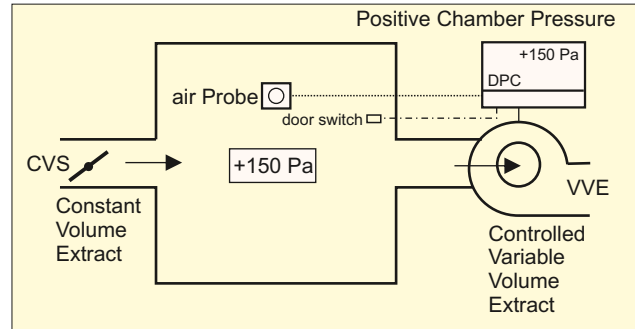
## INDUSTRIAL TEST CHAMBER AIR PRESSURE - AIR VOLUME FAN SPEED CONTROL WITH A DPC-520

### Mode 'G'



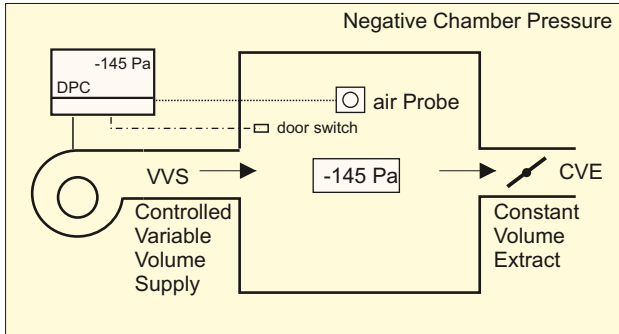
The chamber must be controlled at +150Pa positive pressure using variable volume supply and constant extract. On start up, the supply fan must speed up and starts reducing speed if the chamber pressure is greater than +150Pa. The fan speed locks when a door is opened and re-starts after a time out when closed again.

### Mode 'H'



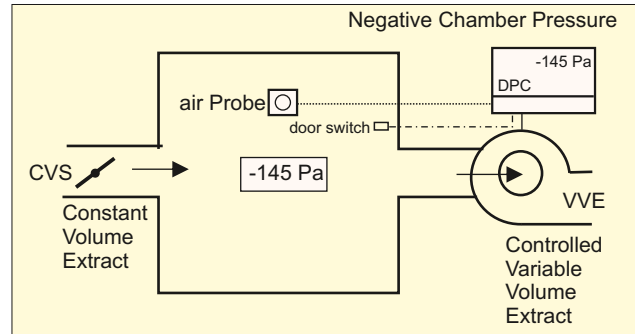
The chamber must be controlled at +150Pa positive pressure using variable volume extract and constant supply. On start up, the extract fan must reduce and starts speeding up if the chamber pressure is greater than +150Pa. The fan speed locks when a door is opened and re-starts after a time out when closed again.

### Mode 'J'



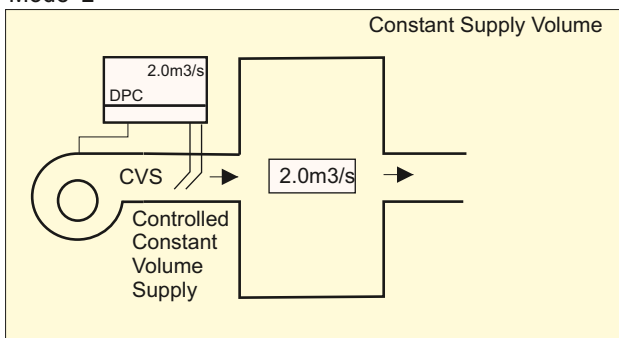
The chamber must be controlled at -145Pa negative pressure using variable volume supply and manual extract. On start up, the supply fan must reduce speed and starts speeding up if the pressure is more negative than -145Pa. The fan speed locks when a door is opened and re-starts after a time out when closed again.

### Mode 'K'



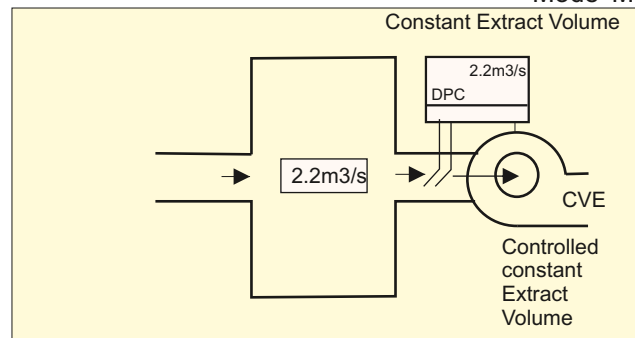
The chamber must be controlled at -145Pa negative pressure using variable volume extract and constant supply. On start up, the extract fan must speed up and starts reducing speed if the pressure is more negative than -145Pa. The fan speed locks when a door is opened and re-starts after a time out when closed again.

### Mode 'L'



The chamber must be controlled at 2.0m³/s constant volume supply. On start up, the supply fan must speed up and if the volume is more than the set point the fan speed starts reducing to achieve the required constant volume. The controller has an adjustable set point to vary the supply volume if required. The DPC can be linked to the extract fan to provide supply to extract tracking.

### Mode 'M'



The chamber must be controlled at 2.2m³/s constant extract volume. On start up, the extract fan must speed up and if the volume is more than the set point the fan speed starts reducing to achieve the required constant volume. The controller has an adjustable set point to vary the extract volume if required. The DPCs can be linked to the supply fan to provide extract to supply tracking.

# DPC-520 PRESSURE VOLUME CONTROL

## CONTROL VALUE LCD

This LCD display indicates the actual Room Pressure.

## CONTROL SET POINT

The control set point of the Room Pressure is set to 45.0 Pa. The set point is displayed in the lower left corner.

## LOW PRESSURE ALARM

The low alarm set point can be set to 40 Pa. If the Pressure is lower than 40.0 Pa then it shall alarm after a time out. The internal timer is adjustable from 1 - 300s which means the alarm buzzer and light switches on after i.e. 20 seconds after the pressure is lower than 40.0 Pa

## LOW VOLUME ALARM

The air volume is monitored and shall control the extract damper to limit the volume in case of total door opening of the room. The volume is too low or too high and alarm can be raised.

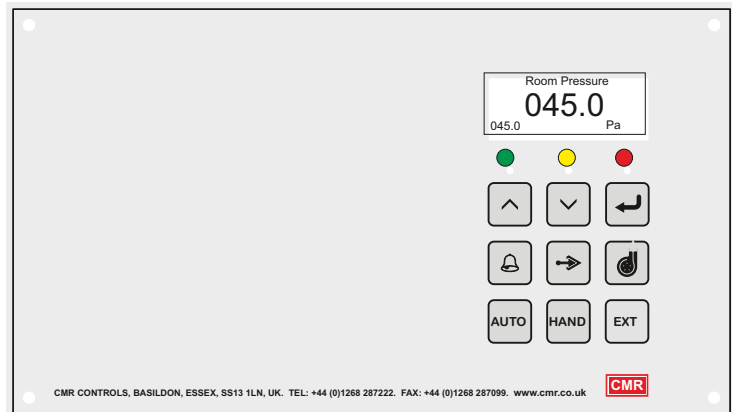
## MUTE ALARM

The BELL button is the mute button and by pressing it the buzzer shall switch off.

The alarm can be permanently muted via the parameter set up which is password protected.

## CALIBRATION MODE

If the CALIBRATION mode is switched to ON the damper motor stops operating and the damper position is locked in the last position. The tubes can now be removed from the velocity sensor and calibration work can be carried out safely.



DPC-520 Controller Front Panel

## AUTO OPERATION

The AUTO switch shall switch the DPC controller into automatic control if it was switched to HAND. Which means the damper motor works on room pressure or volume control.

## HAND OPERATION

If the switch is set to HAND position, the damper motor or Fan Speed Controllers can be positioned with the UP and DOWN arrow keys which program the manual set point to any position from fully closed at 0% to fully open at 100%.

## FAN BUTTON

This is an optional switch to power up a ventilator

## PROGRAM BUTTON

This is used to enter the parameters into the controller and is password protected.

## ALL HEALTHY

The green light is normally on if there are no alarms present. I.e. the pressure or air volume is normal and there is no other alarm present.

## MUTE ALARM

By pressing the BELL button the alarm can be muted.

## AUTO - HAND

When the AUTO button is pressed it shall go into automatic mode. When the HAND button is pressed the damper position can be set to any fixed position. The LCD indicates 'hand'

Room Pressure  
045.0  
045.0 Pa



www.cmr.co.uk



## GRAPHIC LCD DISPLAY

The LCD display indicates the actual Room Pressure or Air Volume. The indicator is duplicated from the DPC controller Actual pressure indicator is scaled in Pa. The display is slower to indicate than the control action as dampening is programmed into the LCD.

## ALARM

The red Alarm Light shall come on in case of pressure or air volume is either higher or lower than the alarm set points. The buzzer shall come on as well if not permanently muted. When pressing the BELL button the buzzer can be muted and also reset if the alarm has been set to latching.

## EXT

The EXT can switch in the external set point from a device i.e. BMS etc..

## DPC-520 Issue 2

BMS wiring from DPC to BMS (20 core shielded cable 0.5mm2)  
Modbus rtu Belden 8102

POSITION  
**045.0**  
045.0 %

L Power Input	N Power Input	PE Earth	0-10V scaled damper motor position out put	COM relay 1 Lamps	NO relay 1	NC relay 1	COM relay 2 Buzzer	NO relay 2	NC relay 2	COM relay 3 Volt Free Contact	NO relay 3 Volt Free Contact	NC relay 3 Volt Free Contact	0-10V actual sensor value output sensor 1	0-10V actual sensor value output sensor 2	Gnd	0-10V External Set Point input	D11 switch in external set point to T2	D12 switch in hand operation to T2	GND	MOD D1 modbus rtu 1	MOD D0 modbus rtu 1
1	3	5	20	28	29	30	31	32	33	34	35	36	41	42	45	46	48	50	56	57	58

24/110/230Vac 30VA

0 VAC

PE Earth

0-10V scaled damper motor position

COM alarm relay

NO alarm relay

NC alarm relay

COM alarm relay

NO alarm relay

NC alarm relay

COM alarm relay

NO alarm relay

NC alarm relay

0-10V Sensor 1 measured value

0-10V Sensor 2 measured value

GND Ground (-) for all in- and outputs

0-10V Set point for auto and hand control

D11 to GND T45 switch in external set point

D12 to GND T45 switch in hand operation

GND

MODBUS rtu D1

MODBUS rtu D0

T46 + Input 0-10V set point from BMS - T45 is GND  
T48 to switch to GND T45 BMS to provide Volt Free Contact to switch in BMS set point on  
T50 to switch to GND T45 BMS to provide Volt Free Contact to switch the DPC in Hand Mode.  
When in hand mode - the set point from the BMS on T46 becomes the set point for the motor position

T20 + Output 0-10V scaled damper position feedback to BMS - T45 is GND  
T41 + Input 0-10V from external sensor measured value - T45 is GND  
T42 + Output 0-10V sensor scaled measured value - T45 is GND

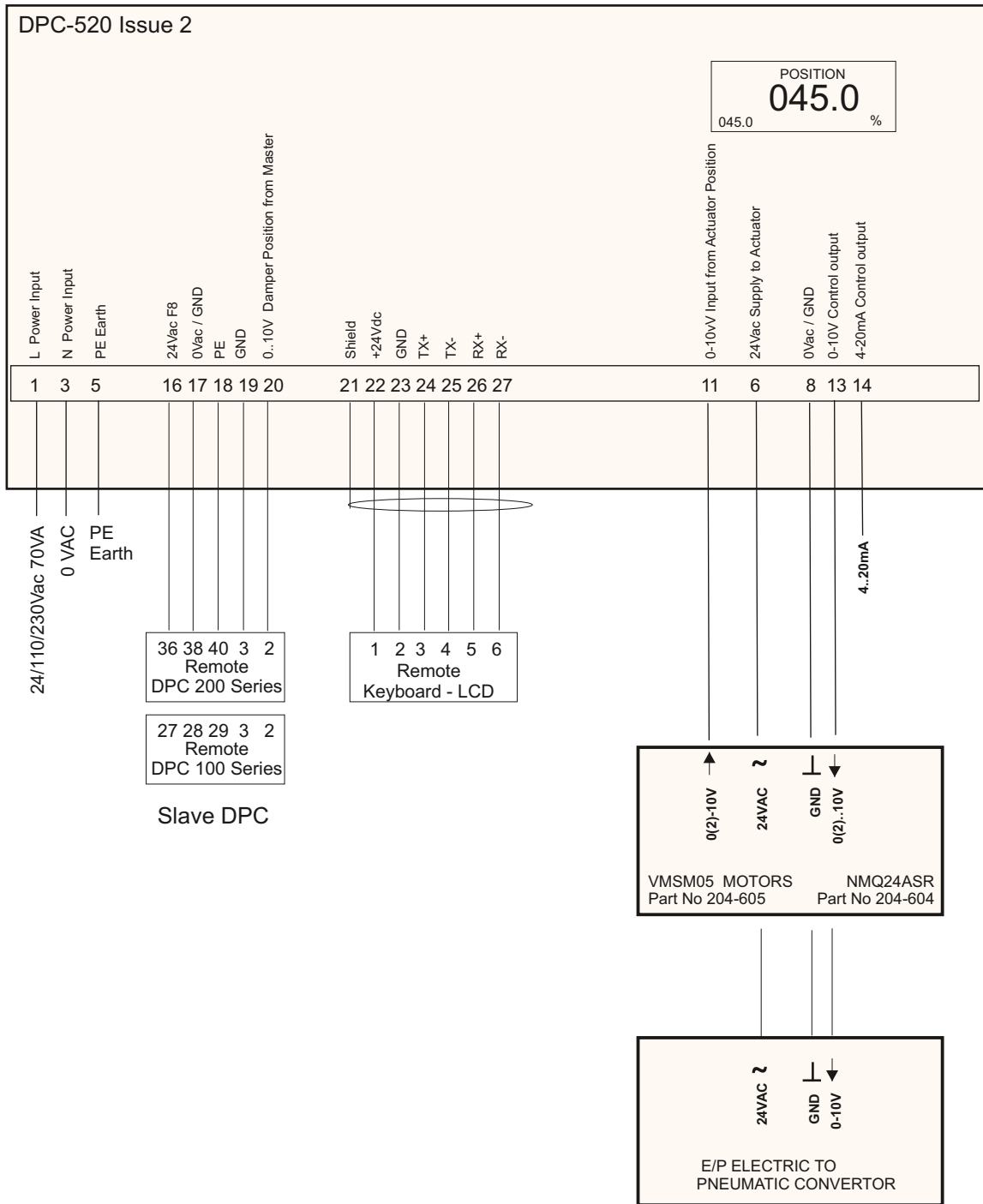
T28 com relay 1 connection for digital input to BMS  
T29 NO relay 1 connection for GND of digital input channel of BMS  
T30 NC relay 1 connection for GND of digital input channel of BMS

T31 com relay 2 connection for digital input to BMS  
T32 NO relay 2 connection for GND of digital input channel of BMS  
T33 NC relay 2 connection for GND of digital input channel of BMS

T34 com relay 3 connection for digital input to BMS  
T35 NO relay 3 connection for GND of digital input channel of BMS  
T36 NC relay 3 connection for GND of digital input channel of BMS

T56 GND modbus rtu Wiring Belden 8102  
T57 D1 modbus rtu  
T58 D0 modbus rtu

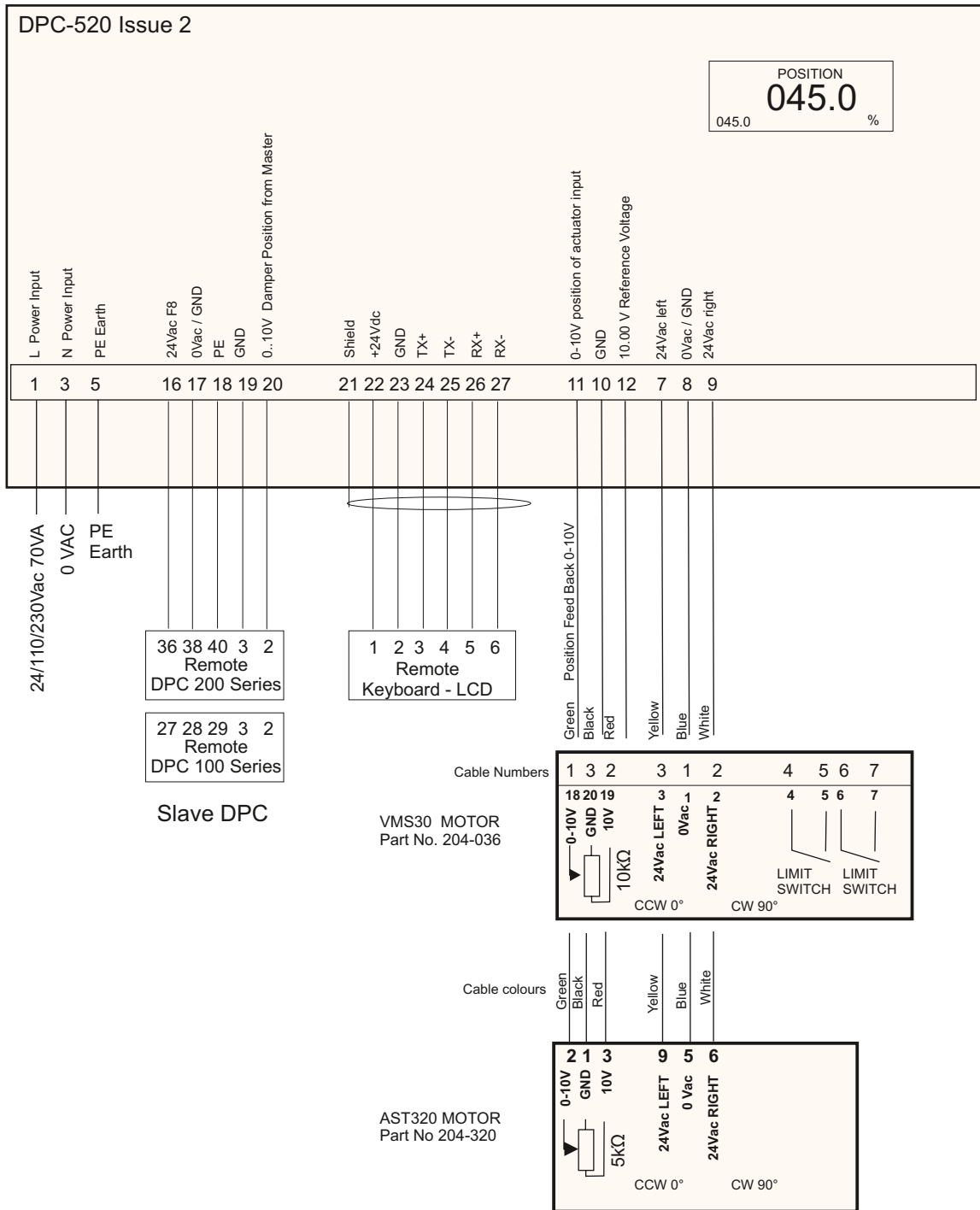
# DPC-520 0(2)..10V - 4..20mA ACTUATOR



Above Drives have no limit switches must be ordered separately.



# DPC-520 24VAC TRI-STATE ACTUATORS



All limit switches must be adjusted to switch off motor on both sides.

# DPC-520

# ORDER DESCRIPTION

## GENERAL

CMR manufactures the DPC-520 wall mount air pressure and air volume controller to suit many applications. Because of the variety of functions and power supplies it has been necessary to design an easy to use selection table for anybody to make up a DPC-520 controller specification to satisfy a requirement. You will find all specifications available with the associated ordering Code on the DPC-520 Controller Selection Table (Page 11). In order to select the correct part we have made up a sample selection below:

## DPC-520 PART NUMBER

The DPC-520 Part Number starts with the selection of the controller type '81'.

## DPC-520 Board Issue No.

The DPC-520 will have an update on the electronic board from time to time and to identify the issue No i.e. for software and hardware, this number might change. For Issue 2 the Code is '2'. The Part Number extends to '812'

## TUBE NIPPLES

The DPC-520 is normally supplied with 6 mm barbed tube nipples.. We have selected Nipple Size 6mm which has the Code 'A'. The Part Number extends to '812A'.

## SENSOR 2 RANGE

In the example we have chosen Range '0250'  
The Part Number extends to '812 A 0250'

## UNITS OF MEASUREMENT FOR SENSOR 2

The measurement units are expressed in Pascals .  
The code is 'P'.

We have chosen Mode 'P'.

The Part Number extends to '812A 0250 P'

## SENSOR 1 RANGE

In the example we have chosen Range '0250'  
The Part Number extends to '812 A 0250 P 0250'

## UNITS OF MEASUREMENT FOR SENSOR 1

The measurement units are expressed in m<sup>3</sup>/h

The code is 'M'. We have chosen Mode 'M'.

The Part Number extends to '812A 0250 P 0250 M'

## CABLE GLANDS

The DPC-520 is normally supplied with Glands so that the motor cable, remote display plate and communication can easily be installed by an electrician to be terminated on terminals.

We have selected Glands which has the Code '0'.

The Part Number extends to '812A 0250 P 0250 M 0'

## POWER SUPPLY

The DPC-520 can be ordered in

24VAC with Code '3'

110VAC with Code '4'

230VAC no power cable fitted with Code '5'

230 UK complete with cable and UK plug with Code '6'

230 EU complete with cable and European plug with Code '7'

All cables are 3 m long .

We have chosen 230V with cable and UK plug which has Code '6'.

The Part Number extends to '812A0250 P 0250 M 0 6'.

## FINAL PART NUMBER

The Part Number to order is '812A0250 P 0250 M 0 6'.

**Now try and select your own DPC-520 using the DPC-520 Order Selection Table.**



# DPC-520 ISSUE 2

# SPECIFICATION

Measurement Range	Sensor 1 and Sensor 2 - See order selection Table DPC-520 Page 11
Optional Range	Any Range from 25 to 7,500 Pa
Overload Capacity	Ranges 25 - 150Pa up to max 1400Pa Ranges from 200 - 7,500Pa 10 times of range
Media	Non Corrosive Gases such as Air,N <sub>2</sub> ,O <sub>2</sub> ,CO <sub>2</sub> ,N <sub>2</sub> O, inert Gases
Sensor Type	Copper Beryllium suitable for high concentration of Formaldehyde. All Stainless on request
AC Power Supplies	24 VAC 50/60Hz Fuse T2.0 A Wickmann
	110VAC 50/60Hz Fuse T315 mA Wickmann
	230VAC 50/60Hz Fuse T315 mA Wickmann
AC Control Output	24 VAC (internal power from isolation transformer) max 2A - 48VA (Fused T2A Wickmann)
DC Control Output	0..10Vdc and 4..20mA
Sensor Output Voltage RL = 5kOhm min	0-10V (0..100% of Range)
Hysteresis/Repeatability	0.1% Typical of Full Scale
Linearity (Accuracy)	0.25% of Full Scale > 100 Pa - 0.25Pa of Full Scale < 100 Pa
Zero Drift	0.02%K (+10°C to +50°C) with auto zero 0.0%
Hand - Auto Key	Digital input on T4 external set point switch T6 change over from auto to hand
External Set Point	0...10V on T2
Position Input	0...10V on T7
Alarm Threshold	On keyboard
Control Function	Off-Set - Sensitivity - Proportional Band - Timing / Integral - Ramp Speed - output Freeze
Alarm Relays	1A 24VDC / AC Low/High Alarm single pole - Buzzer and repeater single pole on-off.
Operating Temperature	+10°C to +40°C (Storage -40°C to +70°C)
Mounting Position	Vertical
Weight	1.7 kg
Electrical Connections	1 x M20mm 4 x M16mm Gland Internal screw Connections.
Air Tube Connections	2 x Positive and Negative Nipple 6.5mm O/D x 15mm long for CMR PVC Tube (4mm O/D optional)
Communication	2 x Modbus rtu - Remote Keyboard Modbus rtu
Enclosure	ABS Grey with clear front Lid - Protection Class IP65.
Conformity	EN61326-1 EMC EN61010-1 SAFETY
Calibration Certificate	CMR issues a Certificate traceable to International Standards (UKAS) as standard

